MANSOURA JOURNAL OF BIOLOGY
Official Journal of Faculty of Science, Mansoura University, Egypt
E-mail: scimag@mans.edu.eg ISSN: 2974-492X

Floristic insight of the Plant Communities along Omom Elbeheira drain, South Manzala Lake, Egypt

Manar M. Nofal [1], El-Sayed F. El-Halawany [1], Yasser A. El-Amier [1,]*

[1]*Botany Department, Faculty of Science, Mansoura University, Mansoura - 35516, Egypt*

**** Correspondence to:** yasran@mans.edu.eg; Tel. +201017229120*

Received:4/9/2023
Accepted:24/9/2023

Abstract : Egypt's vast agricultural lands are interconnected by a network of canals and drains, all of which get irrigation water from the Nile River. The aim of this study is to provide a description of the floristic features along the Omom Elbeheira drain, which is located in the Southeast Manzala Lake area of the Nile Delta. The documented number of the recorded species is 38 (26 perennial, 11 annual and one biennial species). The ecological characteristics of these species allow for their separation into four primary categories: a) two species of submerged hydrophytes, b) seven species of floating hydrophytes, c) nine species of emergent species, and d) 22 species of terrestrial species. Full data about the geographical and temporal change in species composition found in hydrophytes and canal bank species, gathered from several sites along the drains.

keywords: Drains, duration, chorotype, aquatic plants, Manzala Lake, Nile Delta.

Introduction

Agriculture in rainy countries is mostly dependent on precipitation and seldom uses river water for irrigation. Agricultural needs in desert (arid) nations like Egypt cannot be met because of insufficient precipitation. Nile water is used for almost all domestic and agricultural uses in Egypt. Egypt is also enhancing its total water use efficiency by recycling a significant amount of the effluent produced by irrigation and residential water usage; nevertheless, as the country moves closer to a closed water system, it faces a host of environmental challenges. Two-thirds of Egypt's arable land is located in the Nile Delta, where there are 2.27 million irrigated acres. In addition, it's the last stretch of a river basin that supplies food and water to eleven countries. The rapid increase of Egypt's population and agricultural sector are in direct opposition to the plans for further dams and irrigation in the upstream regions of the basin [3].

Egypt is increasing water use efficiency by reusing a large portion of irrigation and domestic effluent, but it is also approaching a closed water system with all the environmental issues [4].. The construction of dams and irrigation systems in the upstream regions of the basin will come into conflict with the expansion of Egyptian agriculture and population [3, 2]. Egypt has 4700 km of canals and drains [5]. These canals and drains are infested with aquatic weeds. Infestation rates are influenced by a variety of environmental factors, including the air temperature, water currents, water quality, water depth, and water clarity. Due to the Aswan High Dam, irrigation canal problems have increased since 1965 [6]. However, [7] attributed the spread of aquatic weeds in Nile Delta irrigation and drainage canals to other ecological factors.

There is a wide variety of physically distinct and dynamic habitats along the Nile Delta shoreline vegetation. The aquatic plant population can be described in terms of its life- and growth-form, species diversity, and other characteristics that stem from the species composition. It's possible to look at it as a framework that connects the biotic and abiotic elements of its environment.

Many Egyptian authors have studied the vegetation of aquatic ecosystems, particularly irrigation and canal banks, from an ecological perspective. For example, Zahran and El-Amier [8] studied the main habitats and plant communities of weeds in irrigated lawn gardens, streets, canal banks, etc. Zahran et al.

[9] described the vegetation and weed communities of Cairo-Alexandria agricultural road small canals and drains. Sultan *et al*. [10] examined middle Delta canal and drain vegetation and floristic composition. Recently, Eleraky [11] Assessed vegetation and environmental factors along drains south Manzala Lake. Abd Elwahed [12] the floristic status and ecological characteristics of macrophytic plant vegetation in some drains south Manzala Lake. The current study aims to explain Omom Elbeheira drain south of Manzala Lake's floristic composition.

2. Materials and Methods

2.1. Study area

The Nile Delta is the most populated region in Egypt, accounting for 41% of the country's total population. It accounts for 2% of Egypt's land area and 63% of the country's total arable land (2,960.0 km^2). The Nile Delta is home to a large portion of Egypt's industrial sector, accounting for 40% of the country's total [13]. Eighty percent of the Nile's water is put to agricultural use [14], making it the region's primary water source. The northern lakes in the Nile Delta are home to a rare ecosystem, but they are threatened by the discharge of wastewater from cities, farms, and factories [15]. As a result, the agricultural sector benefits from the Nile Delta's huge drainage system. El-Gharbiea, Sabeal, Elheoks, El Shakhloubia, Elkashiaa, Baher Tirea, Al-Etaiwey drain, Faraskouir drain, El-Seriw, Hadoius, and Bahr El-Baqiar are some of the major drains in the Nile Delta.

The northern Egyptian coastal lagoons (Mariout, Idku, Burullus, Manzala and Bardawil Lake) are among the most productive natural systems in Egypt and are known globally for their abundant birdlife and fish production. A high level of lake water pollution, due to the industrial, agricultural and sewage wastes poured into the lakes through the drains [16, 17]. One of these coastal lakes is Manzala Lake, located at the northeastern part of Nile Delta, Egypt. In the southernmost section of the lake, there are several different drains. The Omom Elbeheira drain, which can be found in the lake's southwestern corner, was the one that was investigated.

2.2. Estimation of plant species

The current study is represented by a total of 15 stands located along the Omom Elbeheira drain. The stands are dispersed throughout the studied drain to accurately represent the various habitats that they inhabit and to facilitate the collection of samples from a diverse array of flora (Figure 1).

The stands are dispersed across the drain that is being analyzed so that they can accurately represent their various habitats and ensure that a wide variety of plant species are represented in the samples. Specimens of plants were taken from several different stands for the purpose of identification. In the Herbarium of the Botany Department in the Faculty of Science at Mansoura University, where all of the samples were stored, they were kept track of. According to Raunkiaer [18,19], the description and categorization of their various life forms can be found there. The identification, classification, and floristic composition were carried out in accordance with the works of Tutin et al. [20], Davis [21], Zohary [22], Tackholm [23], and Feinbrun-Dothan [25], with the most recent information coming from Boulos [26].

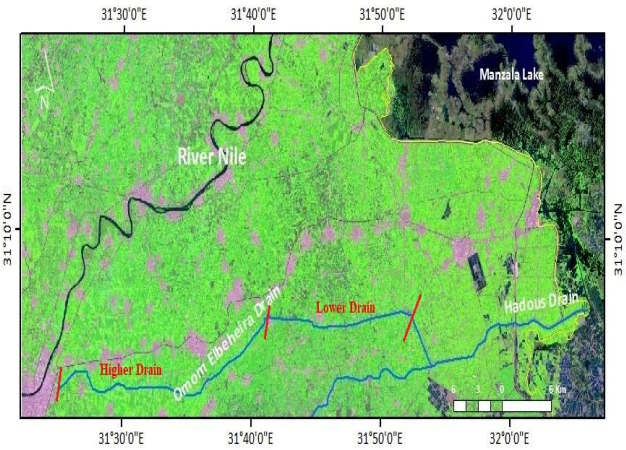

Figure 1: Map of south Manzala Lake showing Omom Elbeheira drain

3. Results and Discussion

3.1. Floristic Composition and Distribution of Plant Species

The total number of the recorded hydrophytes and canal bank species in Omom Elbeheira drain, South Manzala Lake, Egypt are 38 belonging to 35 genera related to 22 families, which could be classified ecologically into four groups (Table 1), **a)** The two

submerged hydrophyte is: Ceratophyllum demersum and Myriophyllum spicatum, **b)** The five floating hydrophytes are: Eichhornia crassipes, Lemna gibba, Lemna minor, Ludwigia stolonifera and Nymphaea lotus, **c)** Nine emergent hydrophytes are: Alternanthera sessilis, Echinochloa stagnina, Persicaria salicifolia, Phragmites australis, Ranunculus sceleratus, Cyperus alopecuroides, Cyperus articulates, Saccharum spontaneum and Typha domingensis, and **d)** The terrestrial plants in Omom Elbeheira drain are represented by 22 species such as; Alhagi graecorum, Amaranthuis viridies, Arundo donax, Bassiea indica, Chenopodeium albeum, Chenopodeium muralie, Convolvulius arvensis, Conyzia bonarienseis, Cynanchuem acutuem, etc

Table 1. The floristic composition of recorded plant species along Omom Elbeheira Drain, South Manzala Lake, Egypt.

No.	Species	Family	Life span	Life form	Floristic category	Distribution	
						Summer	Winter
I)	**Hydrophytes**						
a)	**Submerged hydrophytes**						
1	*Ceratophyllum demersum* L.	Ceratophyllaceae	Per	Hy	COSM	+	-
2	*Myriophyllum spicatum* L.	Halogoraceae	Per	Hy	COSM	+	-
b)	**Floating hydrophytes**						
3	*Eichhornia crassipes* (C. Mart.) Solms	Pontederiaceae	Per	Hy	NEO	+	+
4	*Lemna gibba* L.	Lemnaceae	Per	Hy	COSM	+	-
5	*Lemna minor* L.	Lemnaceae	Per	Hy	COSM	+	-
6	*Ludwigia stolonifera* Guill. & Perr.	Onagraceae	Per	He	S – Z	+	-
7	*Nymphaea lotus* L.	Nymphaeaceae	Per	Hy	PAL	+	-
c)	**Emergent species**						
8	*Alternanthera sessilis* (L.) DC.	Amarantheceae	Per	He	PAN	+	+
9	*Echinochloa stagnina* (Retz.) P. Beauv.	Poaceae	Per	G, He	PAL	+	+
10	*Persicaria salicifolia* (Willd) Assenov	Polygonaceae	Per	G	PAL	+	+
11	*Phragmites australis* (Cav.) Trin. ex Steud.	Poaceae	Per	G, He	COSM	+	+
12	*Ranunculus sceleratus* L.	Ranunculaceae	Ann	Th	ME+IR-TR +ER-SR	+	-
13	*Cyperus alopecuroides* Rottb.	Cyperaceae	Per	He	PAN	+	+
14	*Cyperus articulatus* L.	Cyperaceae	Per	G, He	PAN	+	+
15	*Saccharum spontaneum* L. Mant. Alt	Poaceae	Per	G, He	ME+PAL	+	+
16	*Typha domingensis* (Pers.) Poir. ex Steud	Typhaceae	Per	He	PAN	+	+
II)	**Terrestrial species**						
17	*Alhagi graecorum* Boiss.	Fabaceae	Per	H	ME+SA-SI	+	-
18	*Amaranthus viridis* L.	Amaranthaceae	Ann	Th	ME+IR-TR	+	-
19	*Arundo donax* L.	Poaceae	Per	He, G	Cult. & Nat.	+	+
20	*Bassia indica* (Wight) A. J. Scott	Chenopodiaceae	Ann	Th	S-Z+IR-TR	+	-
21	*Chenopodium album* L.	Chenopodiaceae	Ann	Th	COSM	+	+
22	*Chenopodium murale* L.	Chenopodiaceae	Ann	Th	COSM	+	+
23	*Convolvulus arvensis* L.	Convolvulaceae	Per	H	COSM	+	-
24	*Conyza bonariensis* (Willd.) Tackh	Asteraceae	Ann	Th	NEO	+	-
25	*Cynanchum acutum* L.	Asclepiadaceae	Per	H	ME+IR-TR	+	-
26	*Cynodon dactylon* (L.) Pers.	Poaceae	Per	G	COSM	+	+
27	*Eclipta prostrata* (L.) L.	Asteraceae	Ann	Th	NEO	+	-
28	*Imperata cylindrica* (L.) Raeusch.	Poaceae	Per	H	PAL	+	-
29	*Ipomoea carnea* Jacq.	Convolvulaceae	Per	Ch	Cult. & Nat.	+	-
30	*Malva parviflora* L.	Malvaceae	Ann	Th	ME+IR-TR	+	+
31	*Pennisetum setaceum* (Forssk.) chiov.	Poaceae	Per	H	ME+PAL	+	-
32	*Pluchea dioscoridis* (L.) DC.	Asteraceae	Per	Nph	S-Z+SA-SI	+	-
33	*Rorippa palustris* L.	Brassicaceae	Bi	Th	ME+IR-TR +ER-SR	+	-
34	*Rumex dentatus* L.	Polygonaceae	Ann	Th	ME+IR-TR +SA-SI	-	+
35	*Solanum nigrum* L.	Solanaceae	Ann	Th	COSM	+	+
36	*Sonchus oleraceus* L.	Asteraceae	Ann	Th	COSM	-	+
37	*Symphyotrichum squamatum* (Spren.) Nesom	Asteraceae	Per	Ch	NEO	+	+
38	*Tamarix nilotica* (Ehrenb.) Bunge	Tamaricaceae	Per	Nph	SA-SI+S-Z	+	+

Lifespan in Omom Elbeheira drain.

According to the lifespan and as shown in Figure (2), the recorded species (38) growing in Omom Elbeheira drain can be classified into three major groups: 26 perennial species (68.42%), 11 annual species (28.95%) and one biennial species (2.63%). It is interesting to note that most of the reported species in this research were mostly represented by perennials. This was the case for the majority of the species.

Lifeforms in Omom Elbeheira drain.

According to the description and classification of life-forms, the life-forms of the species recorded in the present study are grouped under seven types as follows: therophytes (12 species = 27.91%), helophytes (9 species = 20.93%), geophytes (7 species = 16.28%), hydrophytes (6 species = 13.95%), hemicryptophytes (5 species = 11.63%), chamaephytes and nanophanerophytes (two species = 4.65%) (Figure 3). It is also evident that therophytes make up most of the species that have been reported, followed by helophytes.

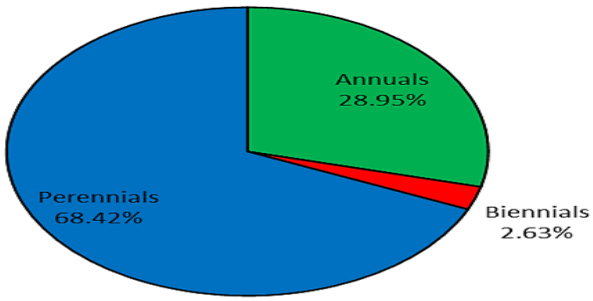

Figure 2. Plant life-span in Omom Elbeheira drain

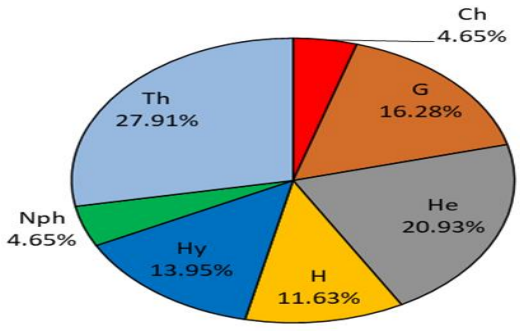

Figure 3. Plant life form in in Omom Elbeheira drain.

The Chorotype of Omom Elbeheira drain.

In the Omom Elbeheira drain, a total of 38 different species of flowering plants have been identified. These plants are from 35 different genera and 22 different families. Figure (4) showed that the family Poaceae comprises 7 species (18.42%) of the total recorded plant species, followed by Asteraceae comprises 5 species (13.16%), Chenopodiaceae comprises 3 species (7.89%), Amaranthaceae, Convolvulaceae and Cyperaceae comprises 2 species (5.26%, each). Each of the remaining families is represented by one species.

Floristically and as shown in Figure (4), the most common floristic elements of the Poaceae are Cosmopolitan (one species), Neotropical (3 species) and Biregional (one species). In Asteraceae, the most common chorotypes are Cosmopolitan (two species), Biregional (2 species), Palaeotropical (2 species), and Cultivated & Naturalized (one species). The abundant floristic elements in Chenopodiaceae are Cosmopolitan (2 species), Biregional (One species). In Amaranthaceae, the floristic elements are Pantropical and Biregional (one species, each), the floristic elements in Convolvulaceae are Cosmopolitan and Cultivated & Naturalized (one species, each). In Cyperaceae the floristic elements are Pantropical (two species). While the other floristic elements of remaining families represented by one species.

The floristic composition of the Omom Elbeheira drain, which is shown in Table (2), indicates that around 28.95% of the total number of species reported are Cosmopolitan taxa. This accounts for 11 of the total documented species. The remaining taxa may be classified as either Mediterranean (9 species, which accounts for 23.68%), Pantropical, Neotropical, or Palaetropical (4 species, each of which accounts for 10.53%).

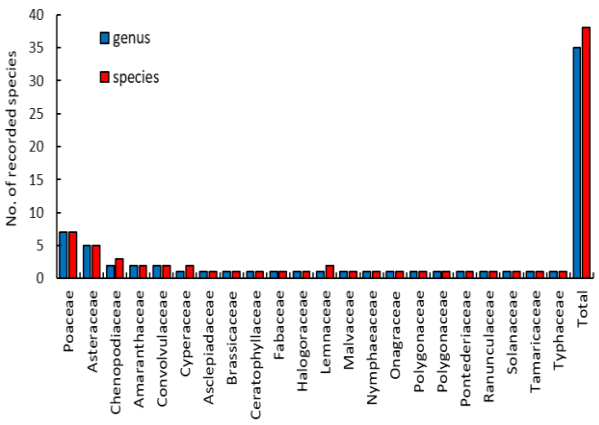

Figure 4. Total number of recorded plant genera and species in the families.

Table 2. Number of species and percentage of various floristic categories in the study area.

Chorotype	Omom Elbeheira Drain	
	No.	%
Worldwide		
COSM	11	28.95
NEO	4	10.53
PAL	4	10.53
PAN	4	10.53
Pluri-regional elements		
ME+IR-TR+ER-SR	2	5.26
ME+IR-TR+SA-SI	1	2.63
Bi-regional elements		
ME+IR-TR	3	7.89
ME+PAL	2	5.26
ME+SA-SI	1	2.63
SA-SI+S-Z	2	5.26
S-Z+IR-TR	1	2.63
Mono-regional elements		
S-Z	1	2.63
Cult. & Nat.	2	5.26
Total	38	100

4. Conclusion

Aquatic plants have been more important in the fight against water pollution during the last several decades. 16 distinct hydrophyte and canal bank species were documented during this investigation, with seasonal and geographical variation in their distribution along the drain. In the summer, more species of hydrophytes were documented than in the winter. The majority of the species in this study are perennials, followed by annuals and finally biennials. It is also evident that, throughout the drain under study, terrestrial plants are the most common, followed by emergent species, floating hydrophytes, and submerged hydrophytes. Therophytes, cryptophytes, chamaephytes, nano-phanerophytes, and hemicryptophytes make up the bulk of the life-form spectrum in the drain of the research region.

5. References

1. Reiss, S.P., (1999). The desert environment. ACM Transactions on Software Engineering and Methodology (TOSEM), **8(4)**, pp.297-342.
2. El-Shirbeny, M.A., Ali, A.M., Khdery, G.A., Saleh, N.H., Afify, N.M., Badr, M.A. and Bauomy, E.M., (2021). Monitoring agricultural water in the desert environment of New Valley Governorate for sustainable agricultural development: a case study of Kharga. Euro-Mediterranean *Journal for Environmental Integration*, **6(2)**, pp.1-15.
3. Hesp, P.A., (1991). Ecological processes and plant adaptations on coastal dunes. *Journal of arid environments*, **21(2),** pp.165-191.
4. Batanouny, K.H., (2000.) Plants in the deserts of the Middle East. Springer Science & Business Media.
5. Zahran, M. A., & Willis, A. J. (2009). The Sinai Peninsula. In The Vegetation of Egypt (pp. 213-249). Springer, Dordrecht.
6. Ghodeif, K., Grischek, T., Bartak, R., Wahaab, R. and Herlitzius, J., (2016). Potential of river bank filtration (RBF) in Egypt. Environmental Earth Sciences, **75(8)**, pp.1-13.
7. Zahran, M.A., El-Demerdash, M.A. and Mashali, I.A. (1990). Vegetation types of the deltaic Mediterranean coast of Egypt and their environment. *J. Veg. Sci.,* **1**, 305–310.
8. Zahran, M.A. and El-Amier, Y.A., (2014). Ecology and establishment of fiber producing taxa naturally growing in the Egyptian deserts. *Egyptian Journal of Basic and Applied Sciences*, **1(3-4),** pp.144-150.
9. Zahran, M.A., El-Demerdash, M.A. and Mashali, I.A. (1985). On the ecology of the deltaic coast of the Mediterranean Sea, Egypt. I. General Survey. Proc. Egypt. Bot. Soc. Ismailia Conf., **4**, 1392–1407.
10. Sultan, M., Sturchio, N.C., Gheith, H., Hady, Y.A. and El Anbeawy, M., (2000). Chemical and isotopic constraints on the origin of Wadi El-Tarfa ground water, eastern desert, Egypt. Groundwater, **38(5),** pp.743-751.
11. Abd Elwahed, M. (2022). Ecophysiological Studies on Impact of Wastewater use in Agroecosystem in the East Nile Delta, Egypt. PhD Thesis, Botany Department, Faculty of Science, Mansoura University .
12. Eleraky, T.E. (2021). Different Types of Remediation Processes on the Drainage Water into Manzala Lake, Egypt. PhD Thesis, Botany Department, Faculty of Science, Mansoura University.

13. Negm, A.M.; Saavedra, O.; El-Adawy, (2016);A. Nile Delta biography: Challenges and opportunities. In The Nile Delta; Negm, A.M., Ed.; Springer: Cham, Switzerland, pp. 3–18.
14. FAO. (2002).Land Resources Information Systems in the Near East. In RegionalWorkshop; FAO: Cairo, Egypt,
15. Abayazid, H., & Al-Shinnawy, I. (2012). Coastal lake sustainability: threats and opportunities with climate change. IOSR *Journal of Mechanical and Civil Engineering*, **1(5),** 33-41.
16. El-Shazly, M.M.; Omar, W.A.; Edmardash, Y.A.; Ibrahim, M.S.; Elzayat, E.I.; El- Sebeay, I.I.; Abdel Rahman, K.M. and Soliman, M.M. (2017). Area reduction and trace element pollution in Nile Delta wetland ecosystems. *African Journal of Ecology*, **55(4):** 391–401.
17. El Kafrawy, S.B.; Bek, M.A. and Negm, A.M. (2018). An overview of the Egyptian northern coastal lakes. In: Egyptian Coastal Lakes and Wetlands: Part I. Springer, Cham. pp. 3–17.
18. Raunkiaer, C. (1934). The life forms of plants and statistical plant geography. Translated by Carter, Fausboll and Tansley, Oxford Univ. Press, London.
19. Raunkiaer, C. (1937). Plant Life Forms. Clarendon, Oxford.
20. Tutin, T.G.; Heywood, V.H.; Burges, N.A.; Moore, D.M.; Valentine, D.H.; Walters, S.M. and Webb, D.A. (1964-1980). Flora Europaea. Vols. **1-5**, Cambridge Univ. Press.
21. Davis, P.H. (1965-1985). Flora of Turkey and the East Aegean Islands. Vols. **1-9,** Edinburgh Univ. Press.
22. Zohary, M. (1966 and 1972). Flora Palaestina. Vols. **1** and **2**. The Israel Academy of Science and Humanities, Jerusalem.
23. Tackholm, V. (1974). Students' flora of Egypt. 2nd edition, Cairo Univ. Press.
24. Feinbrun-Dothan, N. (1978 and 1986). Flora Palaestina, Vol. **3** and **4**. The Israel Academy of Science and Humanities, Jerusalem.
25. Boulos, L. (1995 - 2005). Flora of Egypt. Vols. **1, 2, 3**, and **4**, All Hadara Publishing, Cairo, Egypt.